



Learning in games and games in learning

Vadim Kotukhov

Haaga-Helia University of Applied Sciences

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Abstract

Author(s) Vadim Kotukhov
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<p>People learn something all their life. However, in the begging, as children they learn through playing. The purpose of this thesis is to define the way how games and learning, very well known to everybody aspects, collaborate with each other when people become adults. This connection is researched in this thesis from both sides: from video games perspective as well as from educational perspective.</p> <p>Every human has a need of learning. When this human learns or cognize something, he feels satisfaction, and his motivation to continue increases. There are 2 types of motivation: external and internal. Internal motivation makes people want to achieve goals by themselves, while external motivation comes from outside and do not last long.</p> <p>Gamification is one of the ways to use game's mechanics for educational purposes. It takes different elements of games to increase motivation of students.</p> <p>Quantitative and qualitative methods use in this research. Such as survey and expert interviews.</p> <p>Games' mechanics as well as games themselves can improve the effectiveness of learning processes. Video games can be more effective than standard learning systems such as school or online courses, because of their ability to provide an enjoyable environment for experiments. Gamification as a way of using some of games' mechanics can help and motivate students to proceed within learning courses.</p> <p>There are a lot of diverse types of video games players. And they all could have varied reasons to play video games. However, for many players the possibility to learn and cognize something is especially important. This makes games more attractive. And games with stronger cognition possibilities can hold players longer.</p>
Keywords Cognition, Learning, Gamification, Games, Video games, Game Design

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1 Introduction

People learn something all their life. However, at the beginning, as children they learn through playing. The purpose of this thesis is to define the way how games and learning, very well known to everybody aspects, work with each other when people become adults. This connection will be researched from both sides: from video games perspective as well as from educational perspective.

1.1 Research questions

Most of video games' players do not clearly understand why they exactly play games. Learners could have a lot of different obstacles on their way of learning. The biggest obstacle is lack of motivation emerging eventually. But children who learn basic skills through game does not have this problem.

So, this research tries to investigate the connection between learning and playing. And answer to 3 questions:

- Can video game be called as effective learning system?
- Can games' mechanics as part of gamification be used beneficially in learning?
- How important learning and cognition for players?

1.2 Demarcation

This thesis is focused on researching video games and learning, separated and together. All topics related to adults. Children are not touched here.

1.3 Benefits

This research thesis will be beneficial for educators, who are trying to make their education or learning solutions more engaging, attractive, and successful. On the other hand, this thesis will be also beneficial for game designers and game developers. Though adding proper processes of learning and cognition into their game, they can increase engagement, interest for audience, and make the lifetime of the game longer.

1.4 Key concepts

Learning system – many of artefacts combined in a distinct way, to create an environment that will help with and provide different types of learning processes.

The PBL model – the model of implementing gamified solutions. Based on points, badges, and leader boards.

“The Witcher is a series of fantasy action role-playing games developed by CD Projekt Red and published by CD Projekt. It is based on the book series of the same name by Polish writer Andrzej Sapkowski, acting as sequels to the story of the books.” (Wikipedia 2020.)

“Overwatch is a 2016 team-based multiplayer first-person shooter game developed and published by Blizzard Entertainment. Described as a "hero shooter", Overwatch assigns players into two teams of six, with each player selecting from a large roster of characters, known as "heroes", with unique abilities. Teams work to complete map-specific objectives within a limited period of time.” (Wikipedia 2021.)

“Hate (also threat or aggro) is a mechanism used in many MMORPGs, as well as in some RPGs, by which mobs (enemies controlled by the system) prioritize which characters to attack.” (Wikipedia 2020.)

“Crusader Kings is a grand strategy game developed by Paradox Development Studio. The game is set primarily in Europe in the mid to late Middle Ages.” (Wikipedia 2021.)

“SimCity is an open-ended city-building video game series originally designed by Will Wright.” (Wikipedia 2021.)

2 Learning in games

2.1 The need of learning

Figure 1 shows Maslow's pyramid - widely used scheme to describe the human needs. Nature has laid down in human the needs that ensure his survival. The need of food makes us look for food. The need of comfort and safety - to equip your home. And the need of social status - to communicate with other people, seek their favours and recognition. Needs work according to the principle of carrot and stick. If person ignore them, he experiences discomfort first, and then suffering. On the other hand, their satisfaction causes satisfaction as well as a sense of joy enjoyment and even happiness. Now imagine that person have closed all the above needs, relaxed, sat down, and try to just do nothing. He will feel bored. (McLeod 2020.)

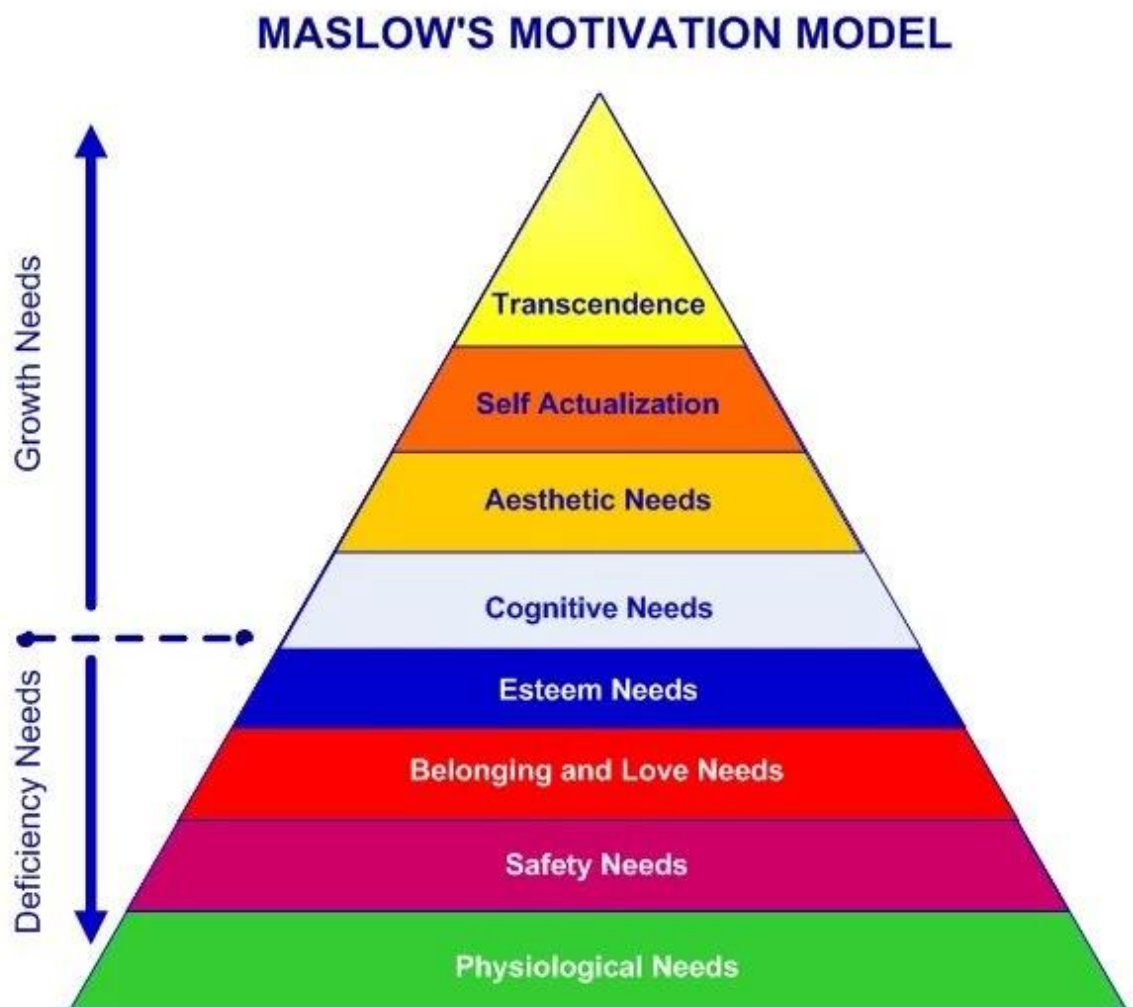


Figure 1. Maslow's hierarchy of needs (McLeod 2020)

The human brain is arranged so that constantly looks for new information. Looking for dependencies in things happened around. It is necessary for survival. The external environment is changeable and unpredictable. Most likely to survive the one who will be able to adapt to them. To learn new is one of the most striking pleasures available to the person. Craving for knowledge, along with learning, is one of the most important human traits.

(Koster 2013, 42.)

External conditions are changeable, which means that genetically set up an organism for some specific, rigidly defined behaviour is a risky move. Conditions will change - the species will die out. Humans have an enormous potential for adaptability, based precisely on an insatiable thirst for knowledge. If weapon is needed - humans use sticks. If heat is needed - humans have learned how to make a fire. If more of both are needed - they mastered nuclear energy. (Koster 2013, 134.)

In general, human body generously rewards attempts to master any knowledge. Because the evolution of tens of thousands of years ago could not predict which of them would be useful and which would not. So, it turns out that from the point of view of reward matters not what to learn, but how to do it. The greatest pleasure comes from effective learning.

(Koster 2013, 40.)

2.2 Motivation

Motivation could be divided into internal and external. However, both types of motivation can be divided into components and apply this knowledge to successfully engage people.

2.2.1 External motivation

External motivation is the stimulation of a person from the outside. Most often, to increase motivation, it is advised to use the carrot and stick model, and in the context of gamified system — to arrange a competition, award badges or give points that can be exchanged for something. (Nicholson 2012.)

Gabe Zichermann, the world's leading expert on the development of strategies for interaction with employees and customers of organizations, in Figure 2 identifies three more types of external motivation, in addition to awards. The higher the type of motivation, the cheaper it is to apply and the more effective it is.

Reward users
the right way

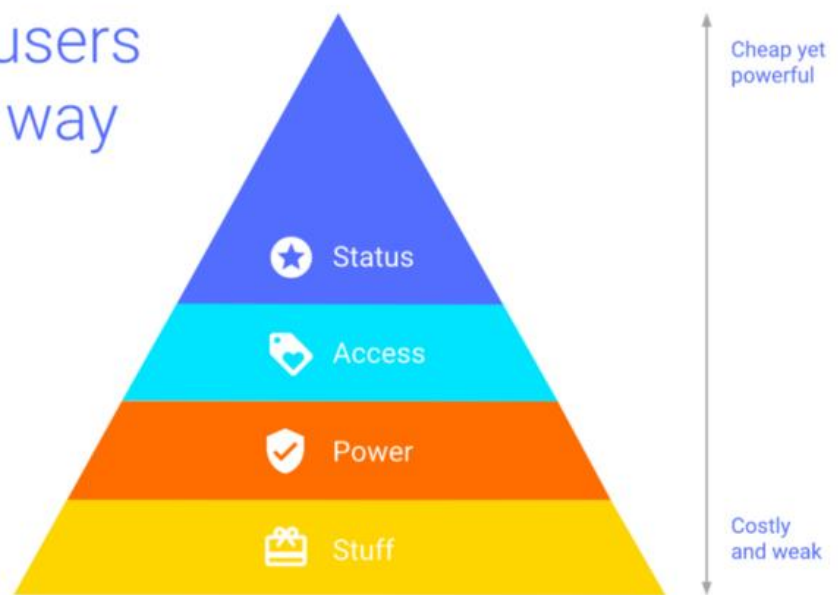


Figure 2. Status, access, power, prizes model. (Zichermann 2013)

According to research data, with the stopping of external stimulation, interest in activities drops rapidly. In the work of A Meta-Analysis Review of Experiments Examining the Effects of Extrinsic Reward on Intrinsic Motivation (Ryan, Deci & Koestner, 1999), 128 examples (mainly from the field of education) of the negative impact of external rewards on the field of self-control were collected. In particular, it was found that material bonuses for well-done work reduce the level of internal motivation to perform even the activities that are interesting to the subject.

It is much more likely to get long-term results in education (when the student continues to be interested in the subject of study even after graduation) if methods that increase internal motivation are applied. (Nicholson 2012).

2.2.2 Internal motivation

This kind of motivation is characterized by the fact that a person starts to do something on their own, internal reasons: for example, when the person enjoys the process of studying the topic, when the final goal is a value for him itself (not in relation to the salary increase, certificate, etc.) or when it is important for the process and the result. (Nicholson 2012.)

American scientists Edward Deci and Richard Ryan (1999) distinguished three types of internal motivation:

- Competence, or the pursuit of proficiency— the desire to achieve maximum proficiency in some field for internal reasons, and not to obtain any advantages.
- Unity - the desire to engage in some kind of activity in a team, with colleagues.

- **Autonomy** - the ability to choose the trajectory of the process and even the final goal.

Competence in the gamification of education is the easiest way to show in the form of a progress bar or the achieving of new levels, depending on the success of the course. The main thing is that the student at any moment understands well what he has already achieved and what else he must learn.

Unity can be achieved in group work or discussion, if we are talking about an online format. To develop this type of internal motivation, you can use team play, the creation of alliances and guilds, tasks that can only be completed together, and other gamification mechanics.

Autonomy is the most rarely encountered type of motivation in the educational context. Usually, a student cannot choose the subject or the topic of a particular lesson, or any parameters of this lesson (for example, from which field examples will be taken). In gamified system, such mechanisms as choosing a difficulty level and character characteristics at the beginning or plot forks during the game itself can be used to emphasize this type of motivation.

(Ryan, Deci & Koestner, 1999.)

2.2.3 Types of players and the evaluation of motivation

Gamified systems use several typologies of players. All of them contain important parameters:

- a person prefers communication with other players or is more interested in the system itself.
- what he likes more - to actively influence or interact.
- whether he perceives the system as a given or believes that it can and should be changed.

Let's focus on two aspects that are important for any typology.

First, depending on the game, stage of life and other parameters, a particular person can manifest himself in completely diverse ways. It means that attempts to find out what type of player, a person belongs to, usually do not make sense. At home, a person behaves one way, at work — another, and on an anonymous forum - in a completely opposite way. Second, the main idea of the most common typologies of gamified system's players is the evolution of the motivation of players during the game from external motivation to internal. (Haefner 2015.)

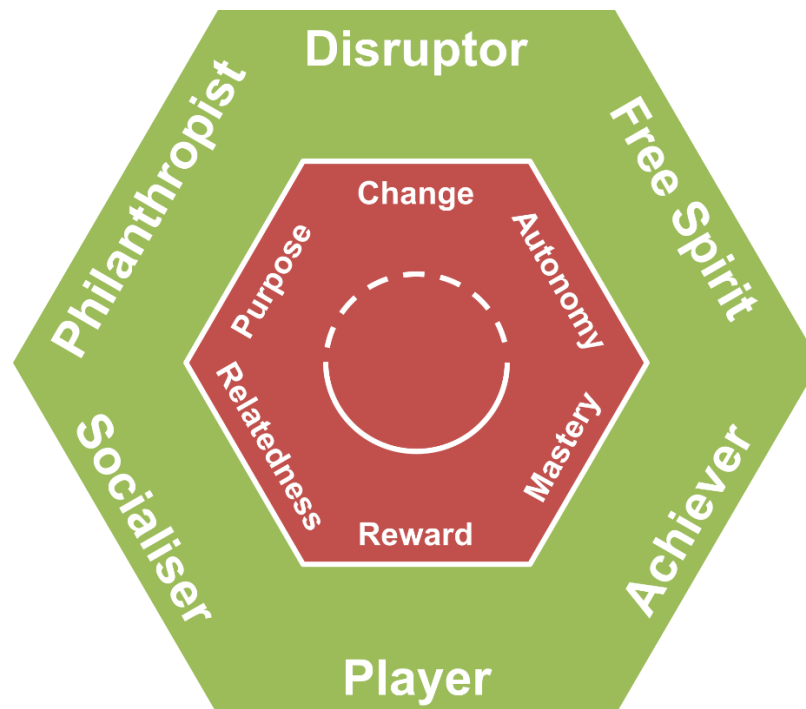
2.2.4 User typology

Describes the relationships of players in games and gamified systems.

Players are divided into three large categories:

- Internally motivated (philanthropists, socializers, free spirits, achievers).

- Externally motivated by rewards. Called “players” on Figure 3.
- Motivated by the opportunity to change the system (disruptor).



© Gamified UK 2014

Figure 3. Gamification player types (Marczewski 2014)

It is quite easy to distinguish a well-made gamified system from a bad one. In good systems, even if everything starts with an external motivation (this is the easiest way to attract fresh players), the main emphasis is on the development of internal motivation, and the results are observed even after the person has left the system.

In other words, if awards, competitions, and ratings will be removed at the end of the game, and the students continue the game anyway, this is a good example of gamified system. If, in order to maintain activity, you need to constantly bring something material from the outside, you can expect a rapid drop of interest as soon as these external investments stop. (Marczewski 2015, 65-80.)

2.3 Games – effective way of learning

To learn something, everybody needs to understand it first. And to understand means to understand how this or that system works. How it reacts to user's actions. Push the ball - it will roll. Throw it into the wall – it will bounce off and fall back into hands. These are the simplest examples that everybody understands since childhood, when they play with the ball and understand how it works.

Any game has this system of rules. To participate in the game, a player needs to understand these rules and learn how to consciously apply them.

In chess, a player needs to know how the pieces move, in the Witcher to deal with abilities and equipment, and in Overwatch to learn the basics of team tactics. The only way to win is to learn to play. It turns out that playing is learning. (Koster 2013, 34.)

Aspect of a game as a learning system.

- feedback

to understand the system, user needs to interact with it. The example with the ball mentioned above, shows the example of the simplest gameplay. The player performs an action, the system reacts to it and somehow changes, and the player gets a certain result. It's such a simple game loop. The human's brain is sharpened to look for patterns in the streams of incoherent signals. The main thing is to give him the opportunity to conduct an experiment. The shooter games' player is aware that a sniper rifle is good at long range, and a shotgun is good at close range. The tank understands how "aggro" works. Crusader Kings's players don't have to explain the danger of feudal fragmentation (there may be several rulers, feudal lords on a small piece of land). The urban planner at SimCity knows where traffic jams come from. But how do they know all this?

They tried it all on their own. The player sets up the experiment himself, observes the results himself, and makes the conclusion himself. Student can and should experiment with good models until he figures them out. (Koster 2013, 122.)

- safe environment

an indispensable condition for experiments is the ability to conduct them repeatedly. For scientists, a negative result is also a result. A training system should not punish mistakes, because mistakes are the way to gain knowledge. Even games are known for their ruthless attitude towards the player, and they especially allow player to try and try until the lesson is learned. (Koster 2013, 50.)

- independence

humans gain knowledge because of research. Game developers set tasks for players. Players look for answers themselves. The solution can be transparently hinted by hints on the download screen, entries in the audio diary and huge quest markers. But still, player will have to connect all the points himself. And independence contributes to the awareness of activity. (Ku 2020.)

- freedom of choice

in an open-world RPG (role play game), players can wander wherever they want. But even in linear adventures (without ability to choose next step of the plot), the player usually has at least some choice: whether it's the opportunity to hunt for secrets or stand and admire the fascinating view, or finally just turn off the game. Having a choice, even if not always essential, activates thinking. After all, it is necessary to choose, which means, it is necessary to understand which option is better. And for this, player will have to think about goals and how to achieve them. Hard commands turn a person from an inquisitive discoverer into a thoughtless performer. (Ku 2020.)

- pacing

if somebody draws a graph showing the dependence of the possession of any skill on time. Then it will be a learning curve. Growth on the Figure 4 alternates with plateau - period when skills continue to accumulate, but they are still not enough to reach a qualitatively new level. At some point, students have a feeling of trampling on the spot. They feel that they are wasting their time and effort, there are no results of their efforts and results are not expected in the nearest future. At such moments, student want to give up classes for a long time, or even abandon them altogether. (Quan 2021.)

Of course, it's good when a person is engaged in some kind of activity for personal reasons, due to internal motivation. (Marczewski 2015, 70.)

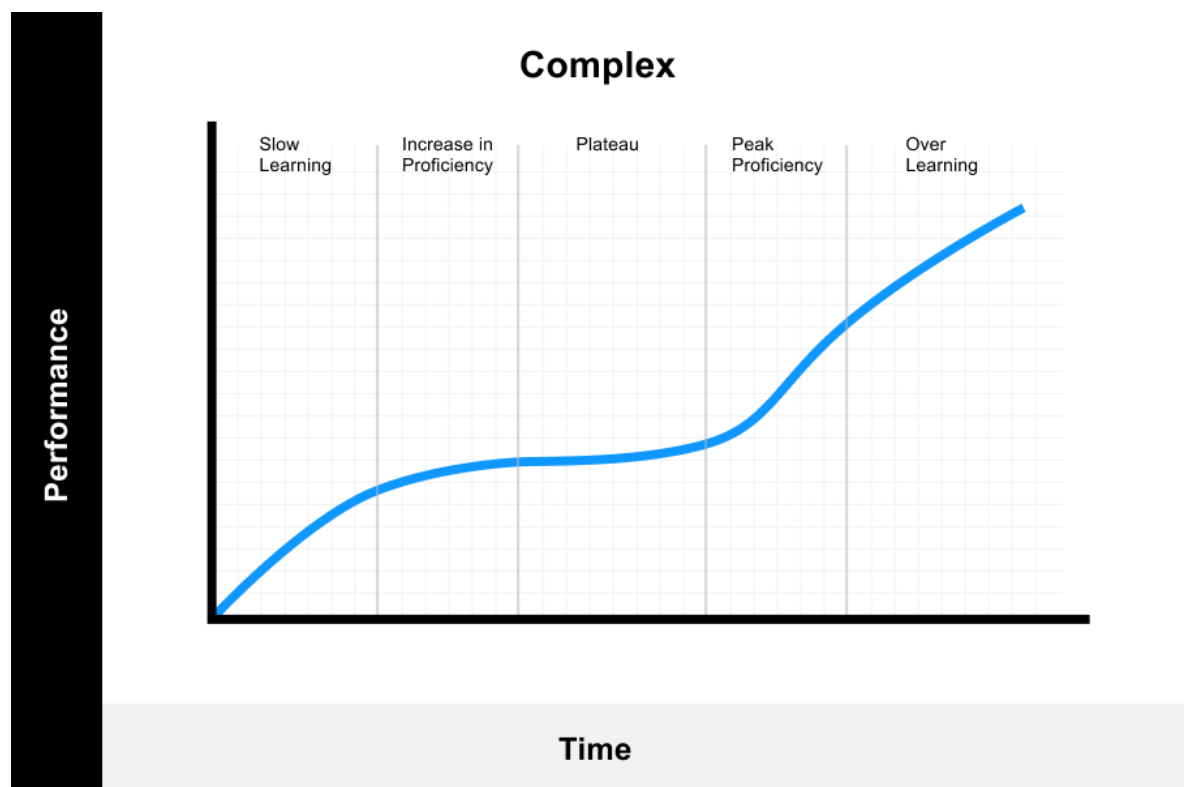


Figure 4. Learning curve (Quan 2021)

But as an exception, in particularly difficult moments, it is quite possible to support a student with the help of awards from the system itself. And games do an excellent job with it. In those moments when a player reaches a plateau and stops visible growth, he can be pleased with something else. Increase the meaningless, but psychologically important numbers of parameters, discover new content, captivate with new modes. Such stimulations allow a player not to quit the game and stay in it longer. Ideally, just until the moment when the player can continue his own development. (Koster 2013, 32.)

3 Gamification

Interest in gamification in the field of education is consistently high. TalentLMS conducted a survey of its clients and found that 61% of respondents are trained using gamification. 83% of those who studied using gamification noted a high motivation to learn. Among those who were trained without gamification, only 28% felt motivated. (Apostolopoulos 2019.)

The gamification matter is complicated by the fact that the approach of increasing motivation in last 10 years has been reinterpreted and significantly changed. Therefore, if the definitions of the 2010s use as a guide now, then there is a chance that the number of actual gamification opportunities will not be visible.

The result of misunderstanding are such common mistakes as the aimless use of game mechanics and an overuse of gamification when the player does not play to gain knowledge.

What can and cannot be called gamification? Variable homework is not gamification. Giving points for completing tasks is also not gamification. But if the points that the students received are displayed on the general screen— this is already an element of gamification, one of the easiest ways to gamify end-to-end learning. (Erdogdu & Karatas 2016.)

3.1 What is gamification

Gamification is not a monolithic phenomenon. Ideas about its goals, capabilities and limitations change as practical experience of application in different fields accumulates.

The term began to be widely used in 2002, and since then, gamification has managed to go through the key phases of the so-called hype curve: the launch of technology, the peak of excessive expectations, getting rid of illusions and the elimination of shortcomings. (Vetushinskiy 2020.)

The most common definition of gamification, which is often used by default, states: *"Gamification is the application of elements of game design in non-game contexts."*

This definition was proposed for the first time in 2011 by Sebastian Deterding, head of the international network of gamification researchers The Gamification Research Network. It has become widespread thanks to Kevin Werbach, the author of the popular gamification course on the Coursera platform.

Although this definition is extremely popular, there were a number of inaccuracies in it. As soon as people started talking about gamification in marketing, HR, and education, The PBL model (points, badges, and leader boards) became the most popular form of its implementation.

It would seem that it is easier: you need to offer people to earn points and advance in the ranking — and now they are already taking the necessary educational course or doing routine work for which they would otherwise require material reward. (Nicholson 2012.).

But practice quickly showed the limitations of this model:

- The emphasis on external motivation (receiving rewards) leads to the fact that such gamification quickly becomes boring and works only at a short distance.
- Due to the neglect of internal motivation (no matter what a person thinks, the main thing is what he does), the element of compulsion becomes obvious and eventually repels the players.
- In addition, an ethical question arises: is the person doing gamification, controls the behaviour of the audience without considering its interests, engaged in hidden manipulation?

(Chou 2015. 3-5, 108-109.)

The response to such criticism was the development of approaches to gamification, which focused on the internal motivation of the playing audience, and gamification itself was considered not just as a set of game elements and mechanics, but as a way to get a better experience.

The modern understanding of gamification in the English-speaking world is determined by the work of three experts: Jane McGonigal, Andrzej Marczewski and Yu-Kai Chou.

The modern definition of gamification can be formulated as follows.

"Gamification is an approach implying the introduction of game elements into non-game processes of the real world (both online and offline), including training, to increase the involvement of students in solving problems and mastering the material."

Gamification in its modern form is a way to reassemble the daily routine. It changes the activity that a person carried out which would have done without it — but perhaps with less involvement, efficiency and pleasure. (Vetushinskiy 2020.)

3.2 Gamification elements

There is no such magic recipe by which any educational solution can be gamified. Each educational task has unique features (including goals, audience, implementation conditions), and effective gamification will always go beyond the established game mechanics. (Nicholson 2012.)

Gamification elements can be interpreted in diverse ways depending on the theory of game design. For example, there is MDA model (Mechanics, Dynamics, Aesthetics), a DDE model (Design, Dynamics, Experience) or an SSM model (System, Story, Mental model).

Figure 5 will be used to explain the principles of gamification in this thesis.

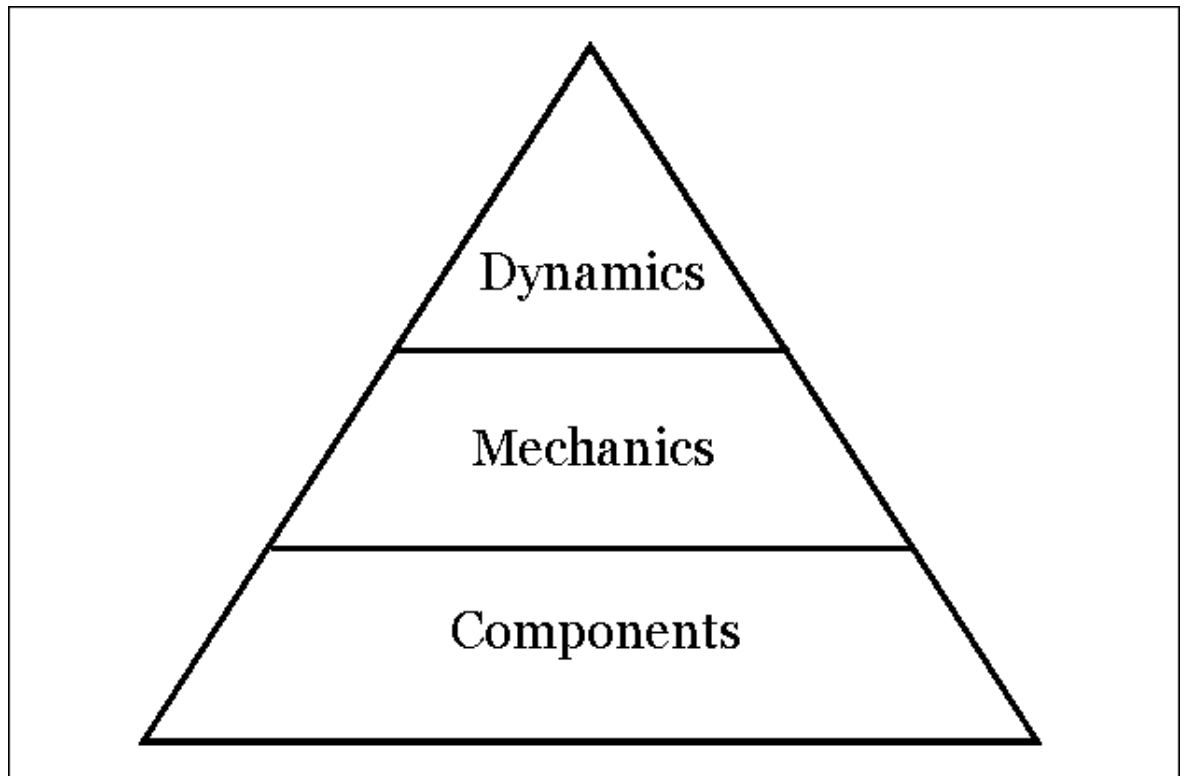


Figure 5. The game element hierarchy (Werbach and Hunter 2012)

- Dynamics

The conceptual level of the game. They create a general picture of what is happening, determine the logic of events and the relationship of the participants in the game.

Examples of game dynamics:

- narration - consistent storyline.
- limitations - limits or forced compromises.
- emotions - curiosity, competitive spirit, disappointment, happiness.
- relationships - social interactions that form feelings of camaraderie, status, and altruism.

- Mechanics

Processes and actions that occur in the game and develop a particular dynamic. One or more mechanics can be used for each dynamic, at the same time one mechanic can be associated with different dynamics.

Examples of game mechanics:

- progression (levelling).
- challenges (tasks, requiring solutions).
- chances (successes and failures, depending on the case).
- cooperation and interaction.
- feedback (participants see the consequences of their actions and move on based on this).
- rewards.
- gaining resources.
- order of turns.

- transactions and deals (trade and exchange between players).
- Components

Elements of the game, with help of which the mechanics are implemented. With components participants of the game directly interact.

Examples of game components:

- Avatars.
- Scores.
- Badges.
- Levels.
- Ratings.
- Quests.
- Fights and battles.
- Virtual goods and currencies.
- Bonus content.

Each mechanic is connected to one or more dynamic, and each component is connected to one or more mechanic.

For example, the mechanics of "progression" is the development (levelling) of the game avatar. To implement it may be needed to use components, such as points (quantitative expression of development), quests (task with which player can get even more points), levels (progression within levels is the purpose of collecting points, and the rate of progress) and avatar (visual displaying how well the player did).

Another popular mechanic is "chance". The effect of surprise, which does not depend directly on the player's actions, but is determined by the will of chance. This mechanic works well for allocating resources, forming random teams, and making decisions.

"Chance" often become a rescue in a limited time. For implementation, can be used a playing cube, a card selection from the deck, bonus content, virtual goods.

Game mechanics are the link between the abstract level of dynamics and extremely specific components of gamification. They influence the behaviour of users in such a way that the goal of gamification is achieved. (Werbach 2012, 77-83.)

3.3 Games' mechanics in educational cases

- Mechanic group "Achievements"

Used to maintain internal motivation to improve skills and move to new levels of learning by demonstrating achievements.

Points, badges, level systems, leader boards, progress bars, certificates are used as components.

Students, like players of classic games, get satisfaction from levelling up skills and moving to a new game level. To do this, the progress should be as visual and tangible as possible. This is reached not only by the visualization of progress, but also by access to more complex tasks after passing the level, the appearance of additional opportunities after completion of training (for example, internships).

(Kruglov 2021.)

- Mechanic group "Award for competence"

Used to call the external motivation of students, rewarding for the time spent, efforts and acquired skills.

Resources, collectibles, "boosters", bonuses are used as components.

This mechanics is related to the mechanics of achievements: rewards are given to the player when the necessary educational or other results are obtained. Thus, the expertise acquired during the game receives confirmation in the form of rewards. For example, the over doing of the plan may be rewarded with "boosters" - amplifiers that give advantages to the student in passing the planned activities.

It is important that rewards are not a formality and have a value within a gamified system. For example, they emphasize status or give new opportunities.

(Kruglov 2021.)

- Mechanic group "Big Idea"

Used to link different learning content, to involve students in a long learning process.

Storyline, legend, virtual assistant, fictional moon world with characters are used as components.

A single plot increases user engagement through emotion, aesthetics, and curiosity.

Learning can be built into the narrative by adding characters, conflicts, drama.

A virtual assistant is a character or the "voice of the author" who guides the player through the entire story, essentially taking over some of the functions a curator or teacher. He can send out tasks or necessary materials, give instructions for passing the game and in other ways help to navigate the game system.

(Kruglov 2021.)

- Mechanic group "Planning"

Used to structure how the learning process will go for students, to encourage following of deadlines and following the learning plan.

Schedule, process maps, instructions, countdown, deadlines, rewards for participation are used as components.

Process maps (instructions for the correct sequence of steps) are mechanics that are often used in board games. By explaining the sequence of actions, the cards help to focus the student's attention on the current task and plan further steps. Timers (counting is common time) and the countdown clock create a sense of urgency and make player more active. In addition, time limits increase the value of the task in the eyes of students.

(Kruglov 2021.)

4 Research methods

4.1 Research Design

The purpose of this study was to collect information to answer the research questions posed. The data obtained was then analysed for better understanding the overall effect of learning and cognition in video games and, on the other hand, the impact of games and their mechanics on the learning process. Structured survey and interviews were conducted to collect data. An approach mixed methods was used in this research. This approach involves the collection of data quantitatively as well as qualitatively. (Williman 2011, 73.)

4.1.1 Interview

The interviews are used to get qualitative data which allows to investigate researched fields from inside perspective and get some meaningful opinions. The interviews were done via email. This method was used because of having flexibility for all involved parties, regardless time zones and working schedule. The interviews are structured and contain of 9 questions. The interviewees were professionals from different fields. The first interviewee is an actual game designer in worldwide game company. The second interviewee is a teacher in university of applied sciences, who teach how to make games. The interviews' questions can be found within the appendix 1 on page 41.

4.1.2 Survey

The survey contains multiple choice and short answer questions. It means that this survey considered as qualitative as well as quantitative research method. The survey contained 15 questions in total. 4 questions about video games were hired if respondent signed himself as neutral or negative to video games. Open questions weren't mandatory to reply. It was made to avoid making this survey too hard for respondents and to improve the number of completed applications. In most of the multiple-choice questions the respondents were asked how strongly they agree or disagree with a statement. Other questions, which were not agree/not agree questions and not and open questions, were question where respondents were asked to "rate from 0 to 10" a statement. The survey is included in the appendix 2 starting on page 41.

4.2 Population and Sampling

The individuals selected were all people who have some experience with video games or learning, to ensure they understand the questions, they were asked. Also, most of respondents were younger than 30 years old. To make sure that they have at least some

experiences with video games. Participants have experience with learning processes, but they will come from diverse backgrounds even countries and age groups. This is to ensure variation in responses and different opinions. The sample size is smaller because individuals for the survey were individually selected. This size provides more specialized and detailed data (Williman 2011, 132).

4.3 Analysis and Data Collection

Webropol survey tool was used to collect survey results. Webropol was used as provided by Haaga-Helia. This tool converts all output data into visualized graphs that make it easy to analyse them. All the data that did not include numbers was analysed with thematic analysis. Some of the text answers were provided in Russian, so translation done by the researcher to make sure that all research's outcomes are standardised.

4.4 Validity and Reliability

During the survey, all respondents were asked simple and brief questions. However, to some questions were added explanations of terms, which were used in these questions. This step was taken to ensure that the respondents had the correct understanding of questions and, thus, could better answer these questions. To ensure the reliability of information collected during the interviews candidates from different fields were chosen. There was peer review of interview questions to ensure that the questions were clear.

5 Results

In this chapter the results of interviews and survey are presented. Analysis of these results presented in chapter 6.

5.1 Interviews results

For this research 2 interviews were conducted with 2 professionals from different fields to get broader understanding of the issue from different perspectives. The interviews contain 9 questions, some of them are multi-layered. Emails were used to communicate with experts.

The interview questions:

1. What is an effective learning system in your opinion? What conditions are necessary for effective learning? Where the learning system is a system for educating and training users. For example, an online course, or a school subject course.
2. Do video games have these conditions?
3. Have you ever encountered game-based learning? What is effective game-based learning? Where game-based learning is learning skills applicable in real life through play. For example, flight simulator, survival simulator, chess.
4. What types of video games are best suited for game-based learning in your opinion?
5. Have you used gamification in your practice? What is a well-implemented gamified solution?
6. What motivates players to play?
7. Is cognition needed in games? Where cognition is learning patterns, new mechanics, skills. Is it important for the players?
8. How is pattern cognition used in game design? How important is it in the design of modern games?
9. What do you think of using video games and game mechanics to teach a profession or real-life skills to normal adults 20+? Does this idea have a future?

Table 1. Answers from the interview 1.

Q1	The effectiveness of learning is often hard to measure. In the short-term people are capable of learning skills and knowledge, however, cultivating this behaviour is much more difficult. Some elements can be thought in a variety of ways: classroom, master/learner, video etc. So, in education we now are using blended forms where offline (school, reality) is mixed with online education (video, gaming, Team sessions etc.)
Q2	Well yes, especially when you want to train in the long-term and learners can use different, better still, individual approaches.
Q3	Yes of course. There are two game solutions I know quite well. The first is a real skill-driven game, the second awareness and behavioural change (it's from psychologists)
Q4	I don't think a certain type can be chosen. A lot of them is in an evolving sometimes experimental stage. Playing games as an effective way to learn is a difficult concept for educators, and for publishers of educational courseware.

Q5	Yes of course, as a game producer. And in the dozens of games created in our minor of course. If it designed with the user and their learning goals in mind and valorised (tested). if the learning goals are reached in the short and long-term using a game-learning approach.
Q6	Depends. It could be challenge, enhanced environment, being attached to "normal" learning environment aka school. Being rewarded and having an individual and engaging experience.
Q7	Yes, but I don't know in which way exactly.
Q8	Depends on if it's important for the goal of the game. But yes, using games, keeping the players in a learning mode especially for getting used to patterns etc. It is where virtuality can help you as a learning and for the educator offer personal experiences.
Q9	Yes, it's not the question if it has a future for people who have spent a big part of their life playing videogames. It's the question if schools, educators and publishers are willing to invest in this.

Table 1 above shows answers from 1st interview. Bertrand Weegenaar is a person with 5+ years' experience of game development and ICT technologies teaching. Business & IT Management Lecturer in Windesheim University in Netherlands.

Table 2. Answers from the interview 2.

Q1	<p>In my opinion, the goal of a learning system is to give the student an understanding of a phenomenon/process/subject area. Understanding is a mental model that a person can use to predict the behaviour of a system and its response to interaction. If a person predicts the behaviour of the system accurately, then he understands this system well.</p> <p>I consider an effective training system a system that allows you to achieve this understanding (not all of them give such a result), and secondly, while minimizing costs / losses (time, willpower, etc.)</p> <p>For effective training, in my opinion, the following conditions are necessary (the list may not be exhaustive, I will just mark the ones that come to mind):</p> <ol style="list-style-type: none"> 1. Feedback - the system reacts to the student's actions, and he can build causal relationship between his actions and the system. 2. Safe environment - the learner is able to experiment freely. Interactions are not limited to reproducing a set of "right" actions and avoiding a set of "wrong" ones. Interactions from the point of view of the punishment system are often ineffective.
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	<p>3. Independence - the learner knows about the system as a result of his own interaction with it, and not from someone else's hands in a finished form.</p> <p>4. Freedom of choice - learner control over interaction with the system and interacts with it of their own free will / in their own areas of interest.</p> <p>5. Rate - the saturation of the process corresponds to the psychological and physiological preferences of people.</p> <p>6. Difficulty - chosen so as not to be too low or too high.</p>
Q2	Many (I would say the vast majority) video games have these conditions.
Q3	I developed a board game that taught the basics of investing. The bottom line was not to talk about abstract concepts, but to give a person the opportunity to experience the pros and cons of different financial strategies and test them on their own. Information is perceived in a completely different way, if you do not read about other people's decisions, but make them yourself.
Q4	It depends very much on what to teach. I would single out immersive (first-person) operations for operations where direct human actions are important, and strategic ones where resource management is important.
Q5	Gamification in education is widely implemented - these are school grades, average grades, and red diplomas. I consider any gamification as evil, and school gamification in particular. Gamification tries to sweeten the pill of uninteresting actions by shifting the focus from internal motivation (when a person does something because he sincerely wants it himself) to external (because he does it for the sake of evaluating from others). This is a sure-fire way to destroy motivation, dissolve responsibility, lull strategic thinking, and develop a host of psychological problems.
Q6	<p>This is a huge topic.</p> <p>Good sources are Raf Koster's Theory of Fun and the MDA framework.</p>
Q7	<p>Most games require players to understand the system. Therefore - yes, it is necessary. Structurally, most games (games and puzzles according to Keith Burgun's classification) need a system that the player will learn, otherwise they simply won't work.</p> <p>This is, of course, important for the players, although they are not always aware of this. However, many of the voiced requests of players (in some genres this is the majority) can be interpreted as requests for a system that is interesting to learn.</p>
Q8	Widely used.
Q9	<p>I believe that the principles of education do not change depending on the age.</p> <p>Only excess and scarce resources change (with age, people have a significant increase in willpower and self-motivation, but their learning potential significantly decreases, and the amount of free time decreases greatly).</p>

If this is the case, then games should be as good for adult learning as they are for children - if they are structured around what adults have more and what less.

Table 2 above shows answers from 2nd interview. Andrey Stolyarov is a person with 2+ years' experience of game development as game designer in Larian Studios.

5.2 Survey results

The survey was conducted through the online service Webropool. The total number of respondents is 46. Every respondent has experience with learning and at least 38 of them have experience with playing video games. This was to ensure that the answers to the questions were relevant. The survey contains 15 question all together. All open questions were not mandatory to answer. The purpose of it was to not push respondents to something and increase rate of finished surveys.

Question 1. What is your age?

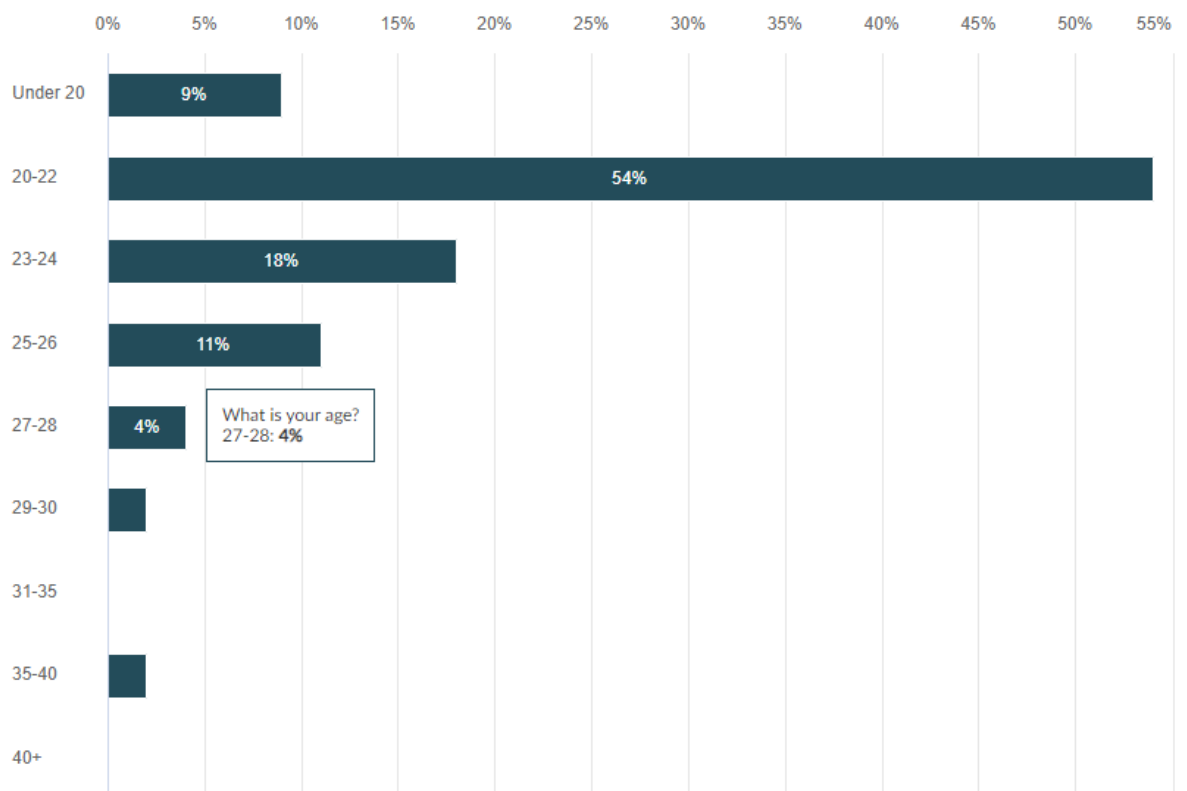


Figure 6. The age of respondents (n=46).

Figure 6 above shows answers for the first question about age of respondents. It was asked to get some basic information about respondents.

Question 2. Do you like play video games?

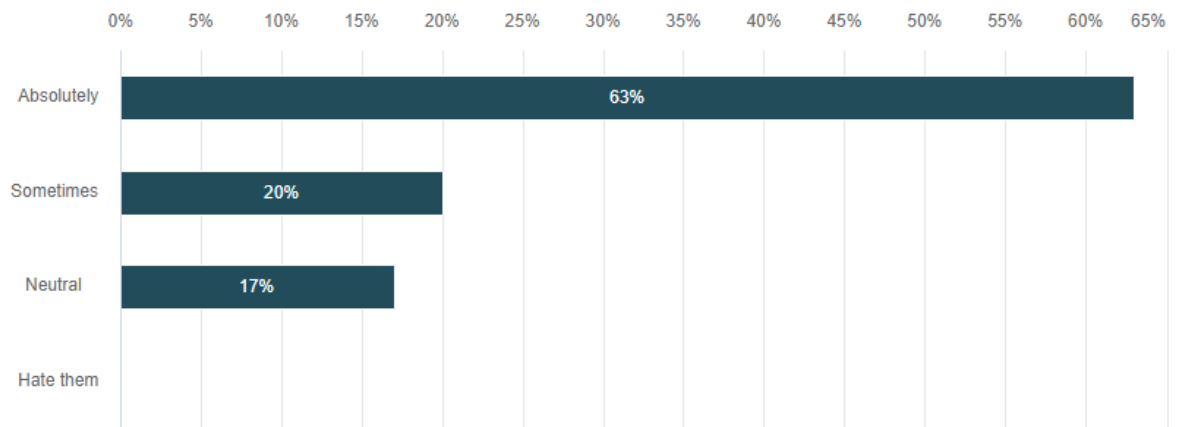


Figure 7. The attitude to games of respondents (n=46).

The purpose of question 2 (figure 7) was to get understanding how the respondents like to play games.

Question 3. How many hours in a week you play video games?

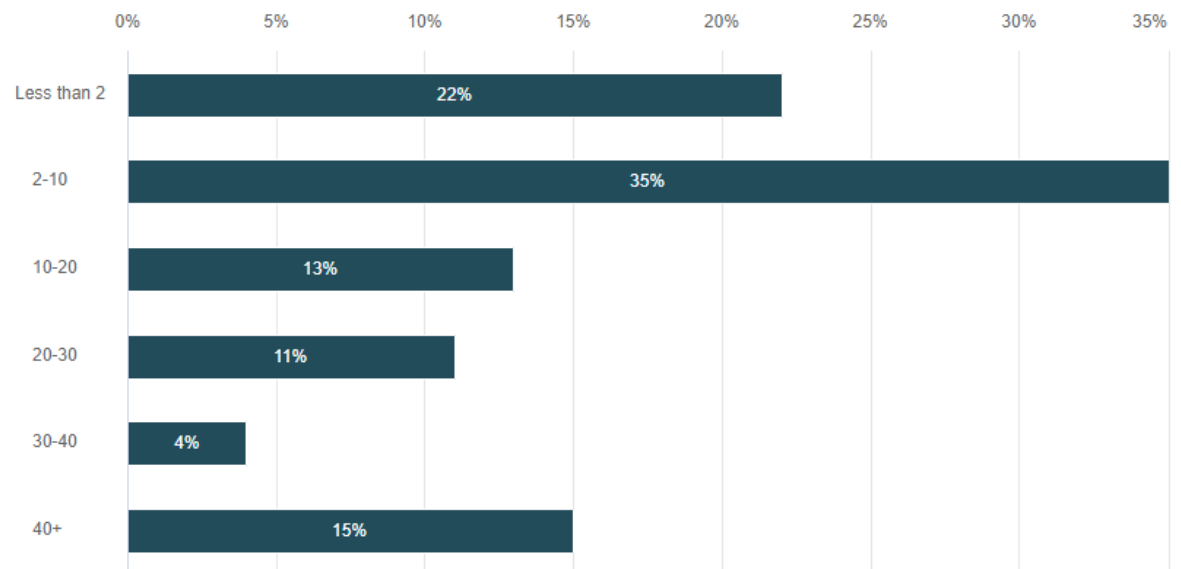


Figure 8. The number of hours respondents play video games in a week (n=46).

Question 3 (Figure 8) was asking about how many hours respondents play video games in a week.

Question 4. Why do you play video games? What motivates you to continue?

Table 3. Respondents' reasons to play games (n=32).

R1	Relaxation after the day. Good story line. Having fun with friends
R2	Just for fun playing and spending a time with friends
R3	Good stories, reliving childhood games, relaxing at the end of the day
R4	I use it as time to relax after a busy/stressful day
R5	Escape from the crushing reality of things

R6	Basically, because for me is one of the best things I do with friends, time flies. Its also a way to keep in touch with them even if we live far from each other
R7	Competition, playing with friends
R8	It distracts me from normal life
R9	I used to love playing with friends
R10	Fun way to spend some time and relax.
R11	Have fun!
R12	Interest
R13	Progression, hone skills, socialize with friends
R14	I don't know
R15	Helps to distract from work, cheers up, brings pleasure, I like to learn new worlds
R16	Dopamine
R17	I just like to kill
R18	Way to relax
R19	For me, games in the first place have always been a way to get away from reality and my problems for a short while, let's say, to forget and dive into the world that is possible only on the screen. Games were also a competitive discipline for me, where I could improve my skills and beat other players. In addition, games often perform a social function, motivating people to communicate and interact with each other. There I found most of my comrades and friends with whom I have been communicating for a very long time, but initially we met in the framework of this or that computer game
R20	There are no anime girls in real life
R21	Video games are a great way to pass the time without being noticed.
R22	Empty hopes
R23	I like different ways of storytelling and challenges it offers. Also, the feeling of progression (dopamine)
R24	Develops skills while enjoying the game (dopamine) Skills depending on the genre of the game, for example: MOBA \ RTS - strategy skills, First person shooters - reaction, Puzzle - Logic, etc.
R25	Because they are enjoyable. And can spark creativity.
R26	Unloading the brain, leisure (better than drinking)
R27	They give me those emotions that I cannot get in real life.
R28	History, plots and interesting worlds. I want to become a writer for games, create interesting stories, deep characters and bring bold ideas to life. Although, sometimes, I run in multiplayer, for a change.

R29	It is fun and it sometimes inspires me creatively. And I think games are just very interesting. I always enjoy seeing the "making-ofs" of games
R30	Pleasure brings
R31	Fun
R32	I just like it when there is nothing else to do

Question 4 (Table 3) was an open question to get understanding why respondents play video games. However, this question was hidden for the respondent if he answered for question 2 "Neutral" or "Hate them".

Question 5. To what extent do you agree with the following statement: I play to learn something new and interesting (such as mechanics, content etc.)

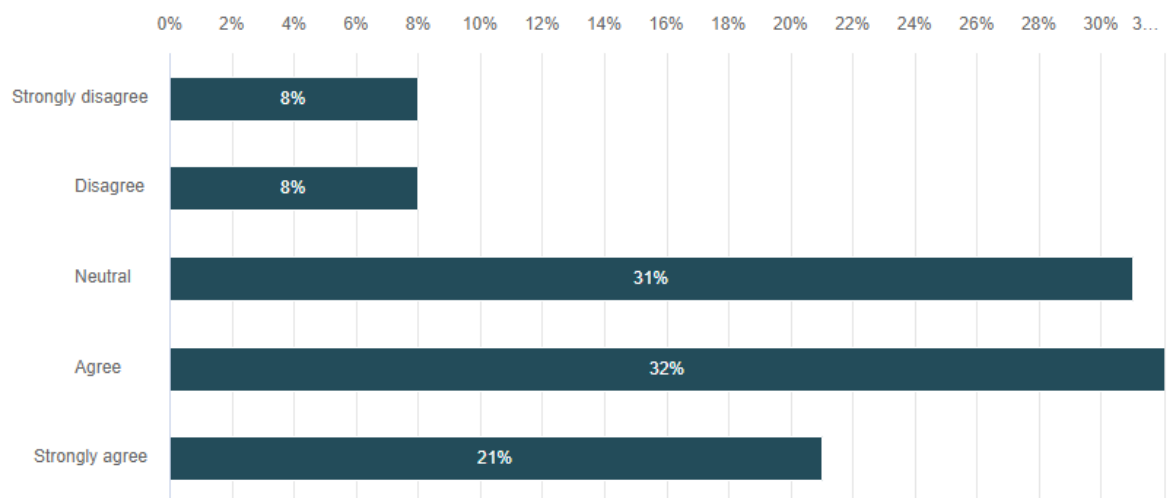


Figure 9. Respondents answer if they play games to learn (n=38).

Figure 9 shows answers of respondents for question 5. How strongly they agree with statement, that they play games to learn or not. However, this question was hidden for the respondent if he answered for question 2 "Neutral" or "Hate them".

Question 6. How important is learning in video game for you? Where learning is learning patterns, new mechanics, skills.

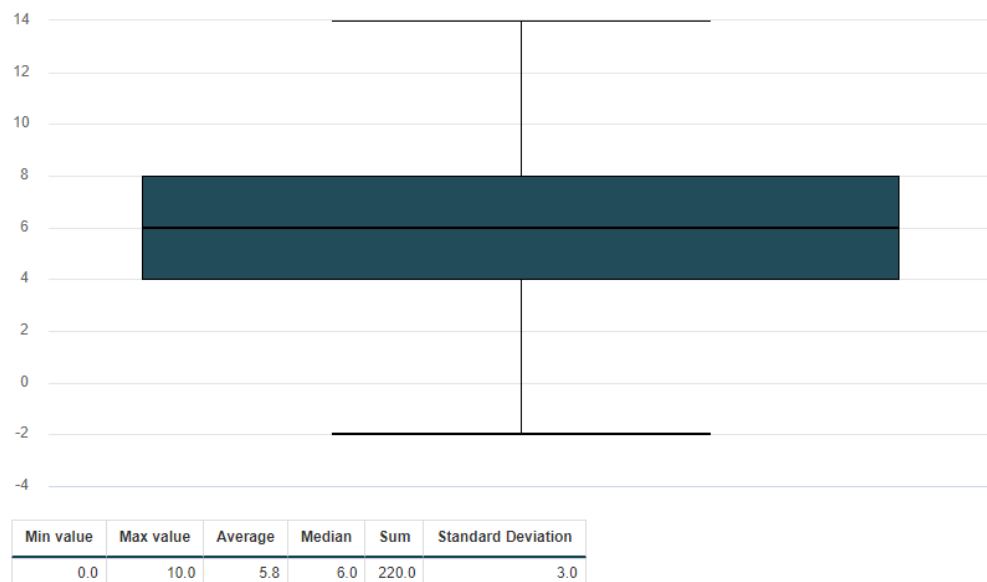


Figure 10. How important is learning in video games for respondents (n=38).

In question 6 (Figure 10) the respondents were asked to rate from 0 to 10 the importance of learning patterns, mechanics, and skills in video games. However, this question was hidden for the respondent if he answered for question 2 “Neutral” or “Hate them”.

Question 7. To what extent do you agree with the following statement: When there is nothing new for me in the game. I get bored and usually drop it.

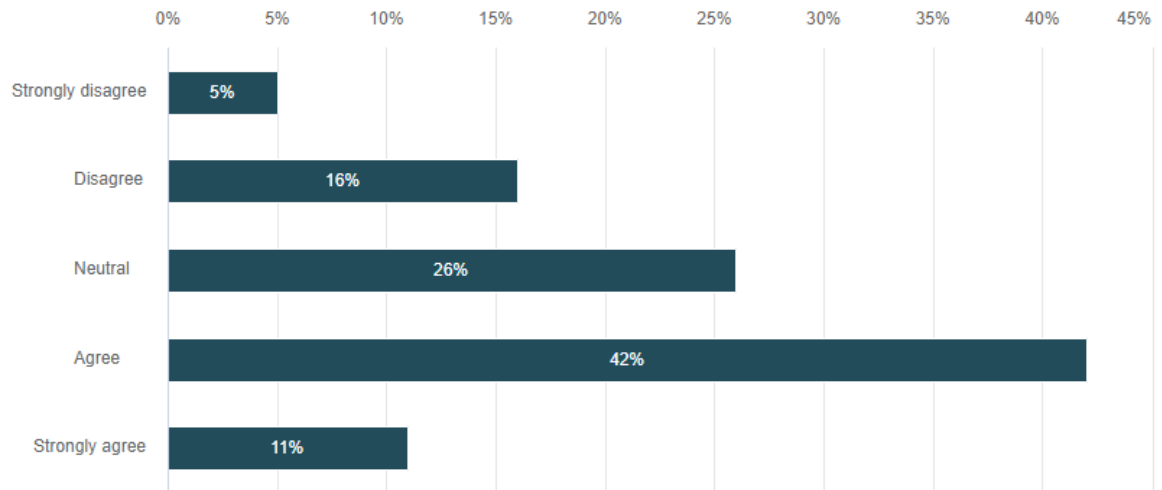


Figure 11. Respondents answer if they get bored when there is nothing to learn in the game (n=38).

Question 7(Figure 11) was about agreeing with statement “When there is nothing new for me in the game. I get bored and usually drop it.” However, this question was hidden for the respondent if he answered for question 2 “Neutral” or “Hate them”.

Question 8. What is an effective learning system in your opinion? What conditions are necessary for effective learning? Where the learning system is a system for educating and training users. For example, an online course, or a school subject course.

Table 4. What is an effective learning system in participants’ opinion (n=30)

	Responses
R1	In my opinion, the most effective educational method is a combination of theory and practice.
R2	Good story line / motivation that continues to play
R3	Using active learning methods
R4	Effective learning happens when people can learn new concepts without lots of efforts in short time. This learning should be able to be transferred to long-term memory and people should be able to adjust the concept in their daily life or their professions when it is needed.
R5	Nonlinear thinking and suitable real-world examples and analogies
R6	More focus on practical experience and real-life situations
R7	learning should be interesting and fun
R8	blue, no, yellow!
R9	a good degree of emotional commitment is fundamental for an effective learning

R10	For me its effective as long as you go back home thinking "I've learnt something". For me it's usually related with how things are taught. From my point of view, doing is much more effective than reading and understanding
R11	Learning by doing
R12	Unique ways of presenting the story. The teacher should find things that interest their students and connect those with the learning material.
R13	To see and hear what you are studying
R14	Just taking the player for sheep!
R15	Practical approaches where you can learn through real images.
R16	A lot of interesting practice on the skills necessary nowadays
R17	Involvement
R18	I don't know
R19	No idea. Involvement of the learner
R20	Dashboard / learning platform, step by step
R21	I have little understanding of how this or that training system should look like, ideally. I believe that everything depends on the person himself and his desire and motivation to receive knowledge. With the above-mentioned qualities, a person will be able to benefit from any system. But perhaps the most effective learning system is one that successfully combines theory and immediately provides practical skills, capable of delivering information without unnecessary information.
R22	Dota 2, there I learned the path of true
R23	The best learning system is life. Everything else is just its variations.
R24	Not really sure
R25	It doesn't matter what, the main thing is less Theory, more Practice.
R26	I have already graduated from the university for 3 years now so I do not know.
R27	I am at a loss to answer.
R28	To do internships of course, Watch courses online, or figure stuff out yourself by searching online.
R29	For a learning system to be effective, first of all, it must present information in such a way that most people understand what it is about, but it is also necessary that the person himself be interested in learning, otherwise all this is meaningless.
R30	Learn system: School Necessary: Motivation

Question 8(Table 4) was about effective learning system. And what aspects of learning system are necessary for effective system. Where the learning system is a system for educating and training users. For example, an online course, or a school subject

Question 9. To what extent do you agree with the following statement: Game is effective learning system.

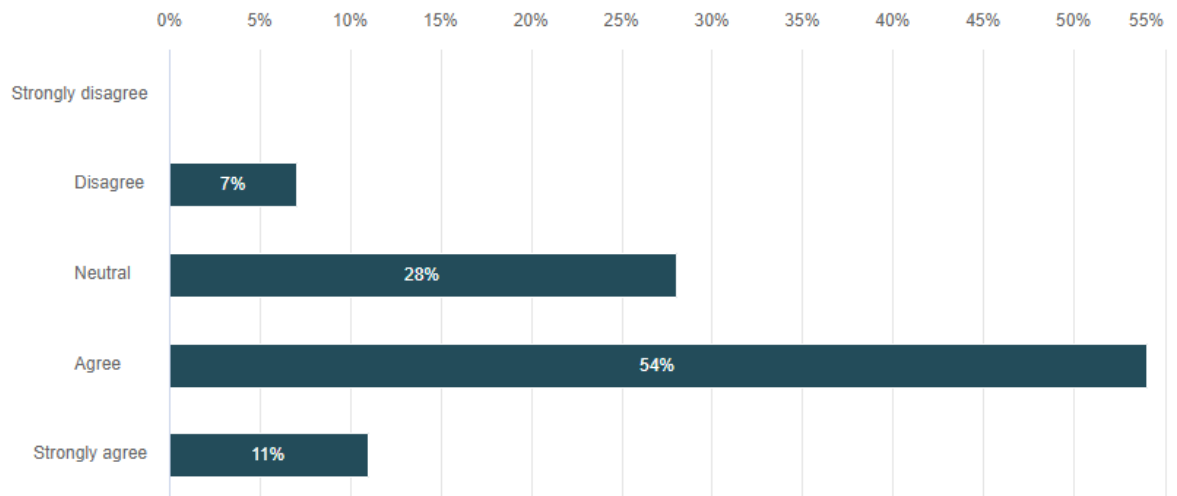


Figure 12. Participants answer if they agree that game is affective learning system (n=46).

In question 9(Figure 12) the respondents were asked if they agree with statement “Game is effective learning system”

Question 10. To what extent do you agree with the following statement: Playing means learning.

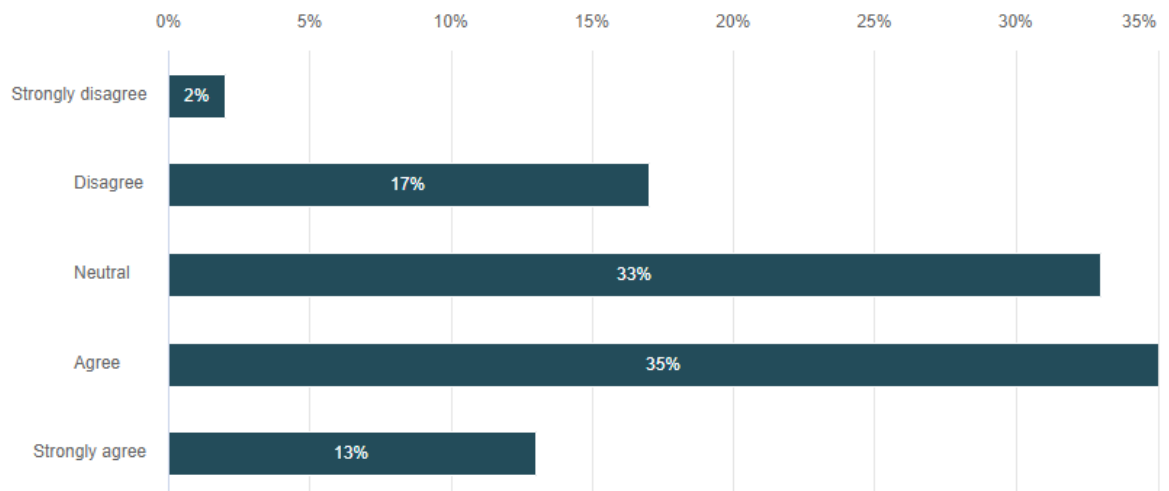


Figure 13. Respondents answer if they agree that playing means learning(n=46).

Question 10(Figure 13) is about agreeing or disagreeing with statement “playing means learning”.

Question 11. Have you met game-based learning (learning some useful real-life skills through a game) in your life? For example, flight simulator.

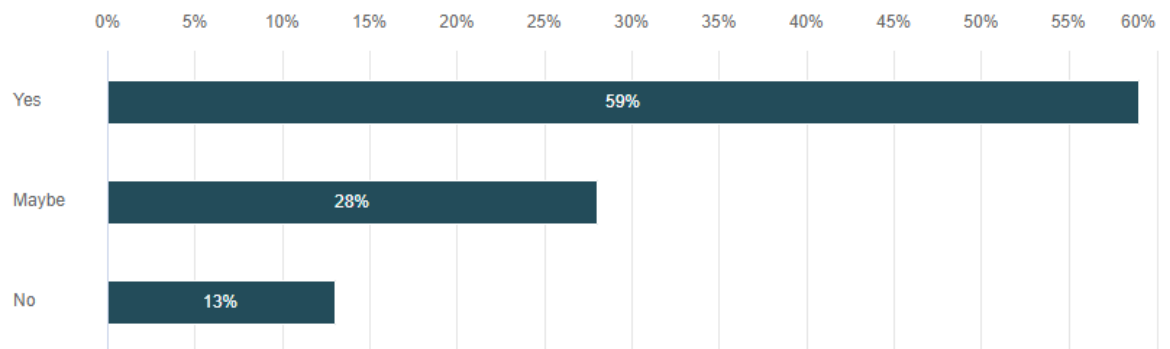


Figure 14. Have respondents met game-based learning in their life (n=46).

Question 11(Figure 14) asked have respondents met game-based learning (learning some useful real-life skills through a game) in their life.

Question 12. How can you rate efficiency of this type of learning?

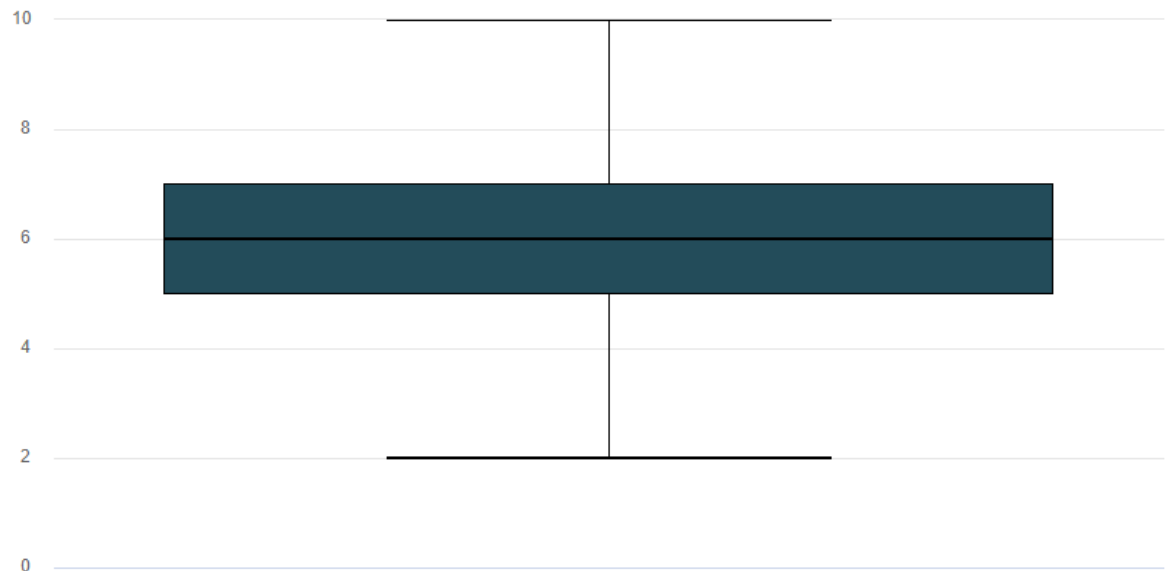
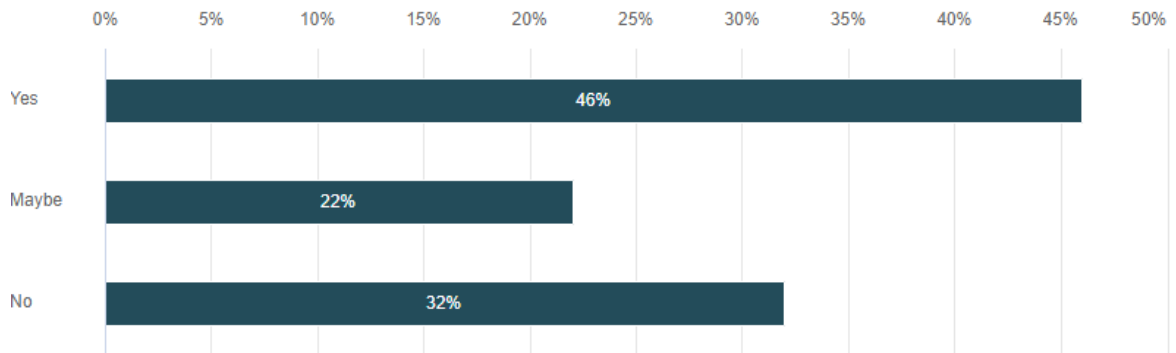


Figure 15. Effectiveness of game-based learning met by respondents (n=40).

Question 12(Figure 15) asked to rate effectiveness of met game-based learning. The question was hired if the participant answered “No” in question 11.

Question 13. Have you met gamification in educational solutions? Where gamification is applying game mechanics outside of the game. For example, progress bars, achievements or leader boards.



n	Percent
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Figure 16. Have respondents met gamification in education in their life (n=46).

Question 13(Figure 16) asked have respondents met gamification in education.

Question 14. How can you rate efficiency of this type of learning?



Min value	Max value	Average	Median	Sum	Standard Deviation
1.0	10.0	6.8	7.0	212.0	2.4

Figure 17. Effectiveness of gamification solutions met by respondents (n=31).

Question 14(Figure 17) asked to rate effectiveness of met gamification solution. The question was hired if the participant answered “No” in question 13.

Question 15. Do you think game or it's mechanics can be beneficial for learning and education? If so, how would you do it?

Table 5. Perspectives of using game and it’s mechanics for learning purposes, respondents see (n=26).

Responses	
R1	Undoubtedly

R2	Yes. Sometimes it could help in different spheres, such as engineering or architectural studies.
R3	Yes, it can be definitely used for the education. When I was in elementary school in Texas, there was educational program for children having English language for their second language. In this program, computer game was used to help children learning. From my personal experience, it was effective as I can learn without resistant feeling or lots of efforts.
R4	Yes
R5	Yes, and it can make learning more fun
R6	yes!
R7	yes
R8	yes
R9	Sure, used in the proper way they could as well as its done with films, for example.
R10	Yes of course!
R11	That's really a fun way to explain your Idea.
R12	Yes
R13	Some people have a highly adversarial trait that can motivate them to learn better. While playing, people are less distracted and more immersed in the topic of learning, with less concentration on the learning process itself and more on knowledge and its acquisition.
R14	Game mechanics help people understand aspects of a task: prevent possible mistakes and prepare for it theoretically. It can help data people work
R15	I don't know.
R16	using animation and playful learning, you can increase engagement and make learning more interactive.
R17	Easily helps to form associations
R18	It is very difficult to objectively answer this question, since most games now have certain mechanics not to educate the players, but, for example, to keep them longer or so that they bring more money to the project. Games have many genres, and each genre in particular has a ton of mechanics, but not all of them are applicable in real life. Boss dodge patterns in dark souls or the WoW beastmaster hunter's solo target rotation hardly come in handy. But the most effective are universal mechanics, such can find application not only in other genres, but, perhaps, in real life. From the most obvious, for example, you can use the "Battle Pass" with its consistent system of obtaining certain awards. This conditionally can be entered for the club card of a store, where for each purchase the client will

	receive certain privileges, which will motivate him to visit your store, as well as motivate him to buy, perhaps a little more than he actually needs
R19	Pickup lessons
R20	No way. Because the functional basis of games and education is different. Games are mainly end-use products. Education, in turn, is more of a semi-finished product. Which already in the conditions of real labour activity turns into something completed. For its subsequent implementation through labour.
R21	Composure and quick decision-making in emergencies.
R22	Strategies develop logic
R23	Yes
R24	Various strategies will help expand and improve a person's logical and strategic thinking, make him think about the current situation, make plans and adapt to situations. Quests and puzzles are also a good option to use thinking. With the help of various tools, in the same VR, you can develop creativity in people, like drawing or music. Co-op and multiplayer non-PVP games (although they can work as well) will allow players to act in teams, choose roles and rely on each other. Video games offer a greater variety of interactions between people and are easier to organize.
R25	Yes, I think there can be ways to put games in education. When I was very young I played a click and point math game called "reader rabbit" for the sole purpose to be better at math. It did help me a lot. And I also played games like "pijama Sam" which also is a click and point game targeted for children from 7-9 years old. There are also more mature click and point games like telltales " the walking dead" or a game fun for all ages "sam and max" which is a great game too. Anyway, I would like to see more click and point type of games in the education system that can be beneficial to children as well as adults.
R26	Any kind of activity can be presented as a game, which makes it easier to understand the components of the activity and increases the interest and involvement of a person in the process of the activity

Last question with number 15 (Table 5) was an open question asked respondents' opinions about how game or it's mechanics could be used beneficially for learning or educational purposes.

6 Discussion

In this chapter both survey and interview are analysed. From this discussion the conclusion will be made in next chapter.

In the survey 46 participants' responds were collected. More than half (54%) of the respondents were from 20 to 22 years old. 4 respondents were younger than 20 years old and 1 respondent was 35-40 years old. Other 16 participants were from 23 to 30years old.

Most of respondents (63%) absolutely like to play games, 9 of them like to play sometimes and only 8 people feel neutral to playing games. 57% of all respondents play video games less than 10 hours in a week, where 22% said that they play even less than 2 hours and 35% play from 2 to 10 hours in a week. Almost the same number of respondents play 10h-20h (13%), 20h-30h (11%) and 15% play more than 40 hours in a week. Only 4% play video games 30h-40h in a week.

Speaking about why people play video games is "a huge topic" (Stolyarov 19 November 2021). There are a lot of varied reasons why people play video games. Weegenaar (15 November 2021) listed challenges, enhanced environment, being attached to "normal" learning environment as well as rewards and individual and engaging experience. The respondent of the survey also listed varied reasons to play video games. Most of the answers were about having fun, interacting with friends, relax and distract from reality. Respondents 23 and 28 (Table 3) mentioned storytelling. Respondents 25 and 29 (Table 3) stated that games spark creativity for them. Respondent 24 (Table 3) said that developing skills while playing is the biggest motivation for him.

53% of survey respondents playing games to learn something new or interesting, such as mechanics or content. 31% stayed neutral about this statement. And only 16% said that they play not for learning. Rate of the importance of learning in video games among respondents vary from 0 to 10 with average on 6.

The same number of respondents (53%) stated that if there is nothing to learn in the game, they get bored and usually drop it. 26% stayed neutral to this statement. 21% said that they will continue play and full understanding of the game system will not make them bored.

Stolyarov (19 November 2021) stated that learning and cognition are necessary and important in video games, however players do not always understand this. "Most games require players to understand the system... Structurally, most games need a system that the

player will learn, otherwise they simply won't work.” This leads to the idea that playing games means learning and understanding of a game system.

13% of the survey respondents strongly agree that playing means learning. 35% agree with the statement, 33 stayed neutral. 17% of respondents disagreed and only 1 person strongly disagreed.

A learning system is considered as a system for education and training it's users. "...the goal of a learning system is to give the student an understanding of a phenomenon/process/subject area. Understanding is a mental model that a person can use to predict the behaviour of a system and its response to interaction. If a person predicts the behaviour of the system accurately, then he understands this system well” (Stolyarov 19 November 2021). The effective learning system has 2 main goals, which are achieving an understanding and minimizing cost/loses.

The following conditions are necessary:

1. Feedback - the system reacts to the student's actions, and he can build causal relationship between his actions and the system.
2. Safe environment - the learner is able to experiment freely. Interactions are not limited to reproducing a set of "right" actions and avoiding a set of "wrong" ones. Interactions from the point of view of the punishment system are often ineffective.
3. Independence - the learner knows about the system as a result of his own interaction with it, and not from someone else's hands in a finished form.
4. Freedom of choice - learner control over interaction with the system and interacts with it of their own free will / in their own areas of interest.
5. Rate - the saturation of the process corresponds to the psychological and physiological preferences of people.
6. Difficulty - chosen so as not to be too low or too high.

(Stolyarov 19 November 2021)

However, “The effectiveness of learning is often hard to measure.” (Weegenaar 15 November 2021). The respondents of the survey were asked what effective learning is and what are necessary conditions for it. Most of the respondents agreed that effective learning system needs to be engaging and practical. Respondent 21 (Table 4) stated few things about effective learning, such as motivation of the user, practical skills, clear and not overwhelming information given in this system. Respondent 5 (Table 4) mentioned “Nonlinear thinking and suitable real-world examples and analogies”. Respondent 12 (Table 4) considered that effective learning system needs to have “Unique ways of presenting the story.” To connect learning materials with something interesting for students.

Stolyarov (19 November 2021) considered that many games can be called as effective learning systems. Weegenaar (15 November 2021) supports this point of view and added

that games are especially good for learning in long-term because of learners' ability to use different individual approaches.

The respondents of the survey were asked to agree or disagree with the statement "Game is effective learning system." Overwhelming majority of them agreed with the statement: 54% agree and 11% strongly agree. 28% of respondents stayed neutral and only 3 respondents (7%) disagreed with the statement.

The respondents were asked about game-based learning (learning of any useful and applicable in real life skills through game. 59% of the respondents met this type of learning in their life, 28% was not sure and only 13% have not met any game-based learning solutions. Then the respondents who met or maybe met game-based learning were asked to rate from 0 to 10 the efficiency of this type of learning. The answers vary from 2 to 10 with 6 as an average. Stolyarov (19 November 2021) shared his experience of developing this kind of board game. "The bottom line was not to talk about abstract concepts, but to give a person the opportunity to experience the pros and cons of different financial strategies and test them on their own. Information is perceived in a completely different way, if you do not read about other people's decisions, but make them yourself." (Stolyarov 19 November 2021).

There are a lot of diverse types of video games. So, the experts were asked about specific types of video games which are more suitable for learning. The type of game depends on what to teach: if this is some kind of human actions than it will be an immersive (first-person) game, if resource management is more important than strategic games would be more suitable. (Stolyarov 19 November 2021).

Various strategies will help expand and improve a person's logical and strategic thinking, make him think about the current situation, make plans, and adapt to situations.

Quests and puzzles are also a good option to use thinking.

With the help of various tools, in the same VR, you can develop creativity in people, like drawing or music.

Co-op and multiplayer non-PVP games (although they can work as well) will allow players to act in teams, choose roles and rely on each other.

(Respondent 24 Table 5)

However, "I don't think a certain type can be chosen. A lot of them is in an evolving sometimes experimental stage. Playing games as an effective way to learn is a difficult concept for educators, and for publishers of educational courseware." (Weegenaar 15 November 2021).

Game's mechanics could be used in educational processes, it is called Gamification. Well gamified educational solution is a solution "designed with the user and their learning goals in mind and valorised (tested). If the learning goals are reached in the short and long-term using a game-learning approach." (Weegenaar 15 November 2021). On the other hand, Stolyarov (19 November 2021) considers gamification as evil, because it "tries to sweeten the pill of uninteresting actions by shifting the focus from internal motivation (when a person does something because he sincerely wants it himself) to external (because he does it for the sake of evaluating from others). This is a sure-fire way to destroy motivation, dissolve responsibility, lull strategic thinking, and develop a host of psychological problems." (Stolyarov 19 November 2021).

The respondents were also asked about gamification in education. 46% of respondents met gamification for education in their life. 22% was not sure and 32% have not met any gamified solutions for educational processes. Those, who met or maybe met gamification for educational purposes, were asked to rate from 0 to 10 the efficiency of this learning solution. Answers vary from 1 to 10 and average efficiency is 7.

The final question of the interviews was about using games and it's mechanics for learning and education, would it be popular among learners. Weegenaar (15 November 2021) does not doubt that it will be popular for the generation of people who spent a big part of their life in video games. However, there is a big question if schools, educators, and publishers are willing to invest in this.

Stolyarov (19 November 2021) believes that the principles of education do not change depending on the age.

Only excess and scarce resources change (with age, people have a significant increase in willpower and self-motivation, but their learning potential significantly decreases, and the amount of free time decreases greatly).

If this is the case, then games should be as good for adult learning as they are for children - if they are structured around what adults have more and what less.

(Stolyarov 19 November 2021).

The survey also contained a question about beneficial using of games and game's mechanics for education and learning. Most of the respondents agreed that using of games and game's mechanics for education and learning is beneficial. Respondent 3 (Table 5) gave an example from his personal experience "there was an educational program for children having English language for their second language. In this program, computer game was used to help children learning. From my personal experience, it was effective as I can learn without resistant feeling or lots of efforts." Respondent 13 (Table 5) stated "While playing, people are less distracted and more immersed in the topic of learning, with

less concentration on the learning process itself and more on knowledge and its acquisition". Respondent 26 was sure that any kind of activity could be presented as a game, which makes it easier to understand and get involved in this activity. On the other hand, some of respondents did not agree that game can be beneficial for learning. Such as Respondent 20 (Table 5) "the functional basis of games and education is different. Games are mainly end-use products. Education, in turn, is more of a semi-finished product. Which already in the conditions of real labour activity turns into something completed. For its subsequent implementation through labour." Respondent 18 (Table 5) also mentioned that games could have tons of different mechanics in them and not all of these mechanics needed to teach a player "for example, to keep them longer or so that they bring more money to the project." Also, not all of skills which could be learned in game are applicable to real life.

7 Conclusion

There are a lot of varied reasons to play games. But the ultimate reason is to have fun. And every player has his own understanding of fun. Sometimes players are not sure or just do not think about what fun for them is. People mostly do things to fulfil their needs. And everybody has his own way to fulfil the exact need. When a need is fulfilled, we feel satisfaction. And if something allows us to fulfil our needs constantly then we consider this kind of activity as fun.

For some people game is not a place to learn. But the survey showed that for at least half of the players play games to learn something. So, we can conduct that learning and cognition are pretty important in games.

The purpose of any learning system is to learn, to give an understanding of something. Learning itself is complicated process contains a lot of various aspects, therefore efficiency of any learning system is hard to measure. But there are still some things which could help and boost the process of understanding. Such as engagement in this process, learn it practically, clear information given, feedback, safe environment to practice, independence, adjustable difficulty, and timely rewards.

All these aspects could be realized in video games. Which allows to call a game as an efficient way to learn and an effective learning system. And more than half of the survey's respondents agree with this. The survey also showed that average efficiency of game-based learning is higher than 5. The average rate of efficiency for game-based learning was 6 out of 10. However, a game has a complex structure which contains a lot of different mechanics. And not all of them used they for learning purposes. So, there is all the time a chance to be distracted by these mechanics.

There are a lot of diverse types of video games. And when there is a goal to learn some kind of skill set, the type of the game should be chosen depending on what kind of skill set is required. However, most of the games with purpose to teach something are still on experimental stage. Using games as an effective way to learn is still a difficult concept for educators, and for publishers of educational courseware.

For educational purposes it's not necessary to use a whole game as a learning system. Some game's mechanics and aspects could be used in educational processes separately from the game itself. This is where a gamification comes to the light. Gamification used to engage users into whatever process by using game's mechanics to increase motivation of users. The survey showed that the most of respondents consider gamification as effective

way to learn. The average rate of efficiency for gamification in education was 7 out of 10. It means that using gamification for studies is beneficial. At least in meaning of motivation.

However, incorrect use of game's mechanics and lack of understanding the difference between internal and external motivation can lead to exactly the opposite effect. Reduce the involvement and interest of the initially motivated user.

7.1 Suggestion for further work

Games and their mechanics could be used for educational and learning purposes in a lot of diverse ways. However, it's difficult to measure how games their mechanics affect learning processes. Depends on specific learning goals the effectiveness could vary a lot.

Implementing these mechanics requires research for each specific solution. But in meaning of engaging and involvement of students this implementation is worth it.

There are a lot of diverse types of video games players. And they all could have varied reasons to play video games. However, this research showed that for many players the possibility to learn and cognize something is especially important.

Game designers should think how to fulfil and use the human need of learning in their games. This can allow a video game to strongly motivate players and hold them longer.

Finally, because a game is learning as well as motivation, playing and learning have strong cooperation. Which could be used for a lot of different purposes. Especially, for education, where students more often lose interest in studied materials.

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Appendices

Appendix 1. Interview questions

1. What is an effective learning system in your opinion? What conditions are necessary for effective learning? Where the learning system is a system for educating and training users. For example, an online course, or a school subject course.
2. Do video games have these conditions?
3. Have you ever encountered game-based learning? What is effective game-based learning? Where game-based learning is learning skills applicable in real life through play. For example, flight simulator, survival simulator, chess.
4. What types of video games are best suited for game-based learning in your opinion?
5. Have you used gamification in your practice? What is a well-implemented gamified solution?
6. What motivates players to play?
7. Is cognition needed in games? Where cognition is learning patterns, new mechanics, skills. Is it important for the players?
8. How is pattern cognition used in game design? How important is it in the design of modern games?
9. What do you think of using video games and game mechanics to teach a profession or real-life skills to normal adults 20+? Does this idea have a future?

Appendix 2. Survey questions

1. What is your age? *

- Under 20
- 20-22
- 23-24
- 25-26
- 27-28
- 29-30
- 31-35
- 35-40
- 40+

2. Do you like play games? *

- Absolutely
- Sometimes
- Neutral
- Hate them

3. How many hours in a week you play video games? *

- Less than 2
- 2-10
- 10-20
- 20-30
- 30-40
- 40+

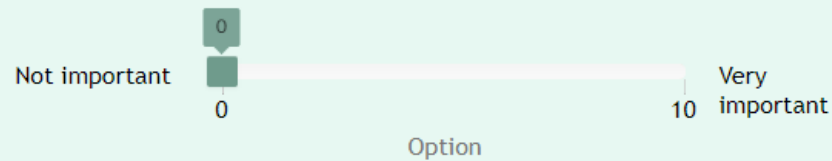
4. Why do you play video games? What motivates you to continue?**5. To what extent do you agree with the following statement: I play to learn something new and interesting(such as mechanics, content etc.)**

*

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree





6. How important is learning in video game for you? Where learning is learning patterns, new mechanics, skills.

*



7. To what extent do you agree with the following statement: When there is nothing new for me in the game. I get bored and usually drop it.

*

- Strongly disagree
- Disagree    
- Neutral
- Agree
- Strongly agree

8. What is an effective learning system in your opinion? What conditions are necessary for effective learning? Where the learning system is a system for educating and training users. For example, an online course, or a school subject course.

9. To what extent do you agree with the following statement: Game is effective learning system

*

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

10. To what extent do you agree with the following statement: Playing means learning

*

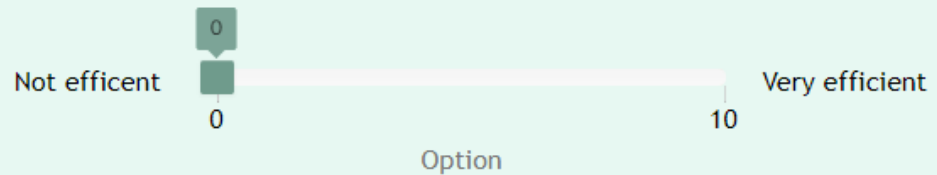
- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

11. Have you meet game-based learning(learning some useful real-life skills through a game) in your life? For example, flight simulator.

*

- Yes
- Maybe
- No

12. How you can rate efficiency of this type of learning?

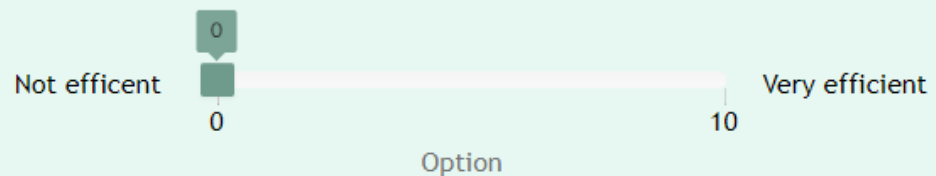


13. Have you meet gamification in ededucational solutions? Where gamification is applying game mechanics outside of the game. For example, progress bars, achievements or leader boards.

*

- Yes
- Maybe
- No

14. How you can rate efficiency of this type of learning?



15. Do you think game or it's mechanics can be beneficial for learning and education? If so, how would you do it?

